Diagnostic tools in Rhinology: AR, Nasal polyps and rhinosinusitis

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Accurate investigations in rhinology...

• Problems: AR, Polyps, Rhinosinusitis
  – Impairment of Quality of life
  – Significant morbidity and even mortality
  – Serious consequences like Wegener’s granulomatosis
  – Exacerbate lower respiratory symptoms
  – May extend to involve lower respiratory tract

Uses of investigations

• Early diagnosis
  – Correct diagnosis, Extent of disease and severity
• Management.
  – Plan: line of management, duration and followup
• Insight into
  – Pathogenesis.
  – Changes during therapy (Pharmacotherapy, immunotherapy)
  – Different forms of inflammatory and non-inflammatory disease

Diagnostic tools

• History
• Nasal examination
• Investigations: Scopy
  – Anterior rhinoscopy
  – Posterior rhinoscopy
  – Nasal endoscopy (rigid and flexible)
  – Diaphanoscopy
• Allergy tests

• Assessing sense of smell and taste
• Nasal nitric oxide
• Nasal sampling: lavages, cytology, biopsies
• Nasal patency evaluation
• Microbiology
• Blood and additional tests
• Imaging
• Future tools

History: Recommendations

• History: Adequate time and attention
  – Complete and accurate history
  – Both rhinitis symptoms and possible co-morbidities.
  – The history should suggest further diagnostic tests
• ENT referral is needed for:
  – unilateral nasal problems
  – nasal perforations, ulceration or collapse
  – sero-sanguineous discharge
  – severe crusting within the nasal cavity
  – recurrent infection
  – periorbital cellulitis (refer urgently)
  – severe sleep problems

Nasal Examination

• Inspection:
  – Nose & face, both during inspiration & expiration
    – Major anomalies can be visualized directly
  – The shape:
    – AR: Horizontal nasal crease across the dorsum of the nose
    – Nasal polyps: widened dorsum of the nose
  – Covering skin of the nose: color changes, edema, scars
  – The surrounding structures: forehead, eyes, cheeks & upper lip
• Palpation:
  – Nasal obstruction
Anterior rhinoscopy

- Possible clinical findings
  - Rhinorrhoea with transparent/discoloured secretions
  - Asymmetries (nasal septum)
  - Mucosal aberrations or edema
  - Nasal polyps
  - Neoplasms, corpora aliena, etc.
  - One can assess the accessibility of the nose and the shape of the conchae.

Posterior Rhinoscopy

- Possible conditions
  - Congenital choanal atresia
  - Acute adenoiditis
  - Irritation of the rhinopharynx
  - Postnasal discharge
  - Antro-choanal polyps and Thornwald cysts.

- Often replaced by nasal endoscopy

Nasal endoscopy

- Advantage of global evaluation of endonasal cavity
- Good evaluation of the septum, the whole nasal cavity & the nasopharynx.
- Area of the middle meatus: clinical importance in rhinosinusitis.

Diaphanoscopy

- Transillumination of human tissue or a cavity with a light source to evaluate the opacity of the hollow sinus.
- Maxillary sinus:
  - Light source in the mouth of the patient, watched in a darkened room.
  - Sinus is accessible (vacant): light shines through sinus and pupil.
- The frontal sinus:
  - Light source is placed at the bottom of the frontal sinus.
- Useful only in case of a unilateral acute maxillary or frontal sinusitis of an adult patient, who did not yet undergo sinus surgery.

- Inspection, palpation and anterior rhinoscopy
  - easy and rapid ways
  - corner stone of every physical examination.
- Persistent nasal symptom: complete and thorough examination using nasal endoscopy.
- Rigid endoscopy: more patient friendly and better image.
**Allergy tests**

- Presence of specific IgE
  - *in vivo* (skin tests, SPT)
  - *in vitro* (RAST, CAP-RAST & equivalent assays)
- SPT:
  - Unanimously considered the gold standard
  - First-line approach for allergic sensitization
    - efficiency, safety and relatively low costs.

**Nasal provocation tests**

- Non-specific nasal challenges:
  - Stimuli may directly act on a single receptor
    - histamine, adenosine monophosphate, and methacholine,
  - Activate complex mechanism
    - Mannitol, capsaicin, hyperosmolar solutions and cold air.

**AR: Diagnosis**

**Assessing sense of smell**

- Rhinitis and/or rhinosinusitis:
  - Complain of smell and taste dysfunction

**Assessing sense of taste**

- Five basic taste sensations: salt, bitter, sour, umami & sweet
  - Sour taste: Citric acid or hydrochloric acid
  - Bitter taste: caffeine or quinine hydrochloride
  - Salty taste: sodium chloride
  - Sweet taste: saccharose
  - Umami taste: monosodium glutamate
- Electrogustometry: widely used to examine sensitivity

**Nasal NO**

- Role of NO:
  - Complex: possibly include antibacterial effects, pro-inflammatory effects, & regulation of blood flow & ciliary beat frequency.
  - Exhaled NO levels: Raised in eosinophilic asthma
  - Provide a rapid, low cost, objective measure inflammation.
  - greater levels of NO are produced in the upper than in the lower respiratory tract
  - Measurement: Chemiluminescence- non-invasive techniques
Nasal Sampling: lavages, cytology, biopsies

- Nasal blow secretions
- Nasal lavage
- Sinus packs / filter paper
- Endoscopy guided swab
- Microsuction technique
- Nasal brush
- Nasal scraping
- Nasal biopsy: Polyps, Papilloma

Comparison of different techniques

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
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<tr>
<td>Nasal blow secretions</td>
<td>Easy to perform</td>
<td>Lack of nasal patency</td>
</tr>
<tr>
<td>Nasal lavage</td>
<td>Easy to perform</td>
<td>May require nasal patency</td>
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<tr>
<td>Sinus packs or filter paper</td>
<td>Limited dilation of medids.</td>
<td>No information about mucosa</td>
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<tr>
<td>Endoscopy guided swab</td>
<td>Medids positive ability of bacteria to cause nasal patency</td>
<td>Relatively minor yield of medids and cilia</td>
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Evaluation of Nasal Patency

- Peak nasal inspiratory flow
- Rhinomanometry
- Acoustic rhinometry

Evaluation of Mucociliary Clearance

- Mucociliary clearance time
- Nasal NO (very low) in contrast to CRS, NP and other nasal inflammatory conditions.
- Electron microscopy evaluation of the epithelial cilia
- Ciliary beat frequency measurement
- The definite proof epithelial cell cultures & Ciliogenesis in vitro

Microbiology

- Colonization versus infection
- Culture sensitivity:
  - Swab from Nose or Sinus...?
  - Poor correlation: Misinterpretation of the results.

Blood and Additional Tests

- Allergic Rhinitis:
  - Allergen-specific IgE.
- Severe non-infectious, non-allergic rhinitis:
  - Full blood count (AEC),
  - Thyroid function, thyroid auto- antibodies
  - Anti- nuclear antibodies, extractable nuclear antibodies (anti-Ro & anti La- Sjogren’s syndrome-QLPS)
  - Pregnancy test or tests for drugs of addiction on urine.
  - Beta-2 transferrin, Glucostix test strips
Blood and Additional Tests

- **Rhino Sinusitis without polyps**
  - Full blood count: TC, DC, ESR and/or C Reactive Protein
  - Renal, liver and thyroid function
  - Humoral immunity markers: IgG subclasses, specific antibody levels (tetanus, haemophilus, pneumococcus) and response to immunization if low
  - HIV status
  - Serum ACE level
  - c-ANCA

- **Rhino Sinusitis with polyps**
  - Churg Strauss syndrome (CSS):
    - ANCA (pANCA pattern with specificity for MPO)
  - Aspirin sensitivity:
    - Aspirin provocation test
  - Cellular antigen stimulation test (CAST)
  - Fungal sinusitis:
    - Deficits in the innate and acquired immunity
  - Primary ciliary dyskinesia:
    - Microciliary clearance time, Nasal NO, Electron microscopic evaluation, ciliogenesis in vitro
  - Cystic fibrosis:
    - Blood analysis for CFTR gene mutations (homozygote & heterozygote gene mutations)

**Imaging in Rhinology**

- X-ray
- USG
- CT: MDCS, MSCT
  - Caution in Children...!
  - Timing...
- MRI
- CT + MRI:
  - Complimentary...

**Radiological Evaluation**

- A CT scan
  - mandatory before sinus surgery
  - during surgery
- MRI
  - helpful for the diagnosis of fungal disease and tumor or if intracranial extension of disease is suspected.

**Summary**
References

- Google images for Pictures